

CO₂ long-term periodic injection experiment at Mont Terri (CO₂LPIE)

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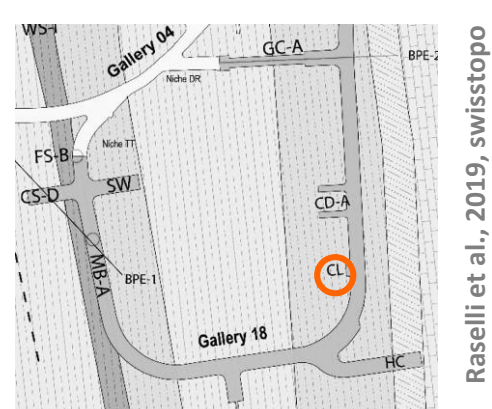


motivation + goals

- use of the subsurface, e.g., CO₂ sequestration, geothermal energy, nuclear waste, energy storage
- understanding of reservoir complex and its heterogeneities required for reliable site specific characterisation, prediction, and risk assessment
- investigations on barrier rocks need to be intensified in respect to properties and alterations, here Opalinus clay can act as representative proxy
- knowledge of geomechanical and geochemical parameters is essential, e.g. reactivity rates, mobility values, in-situ permeability
- data based on long-term experiments contribute higher precision, improvement of estimated or extrapolated data, esp. extension of *pT*-coverage and long-term evolution
- long-term CO₂ exposure gives information on geochemical reactions with minerals and formation fluids, adsorption of CO₂ in clayrock, behaviour of CO₂, pressure development, deformation

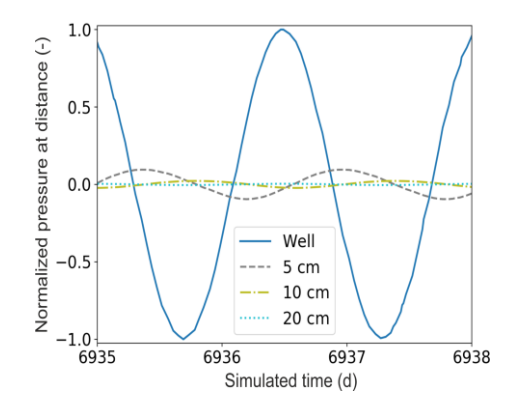
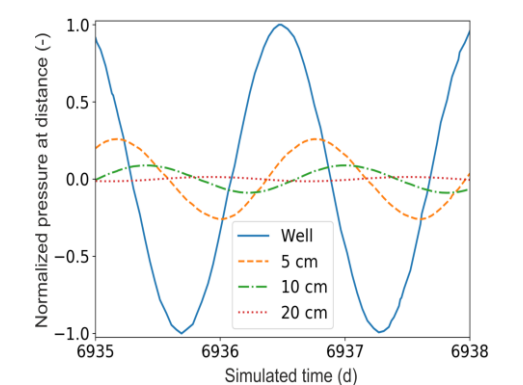
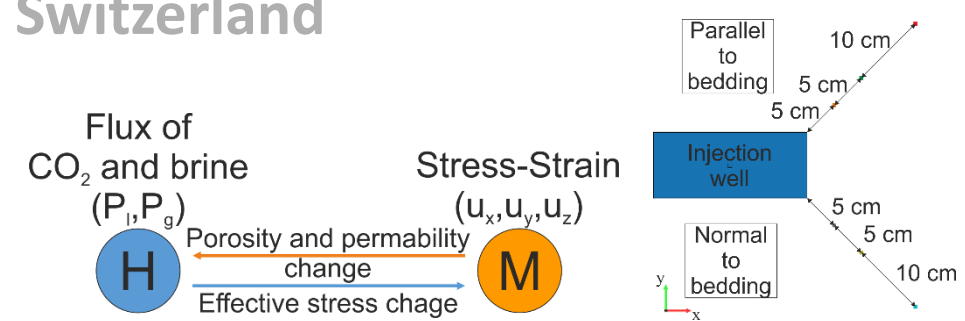
concept + measurements planned

- boreholes in existing Niche CI for injection and monitoring, >10 m, perpendicular to bedding in undisturbed rock (<25 % sand content, no carbonates), site characterisation based on mini-seismic, geoelectric, drill core, literature
- baseline measurements e.g. of temperature, pressure, chemistry, and deformation
- periodic CO₂ injection (+ tracers) scenario dependent on feasibility, >10 a
- continuous monitoring with redundant sensors and measurement principles
- synergy of in situ experiment, laboratory measurements, numerical modelling of geochemical and geophysical parameters



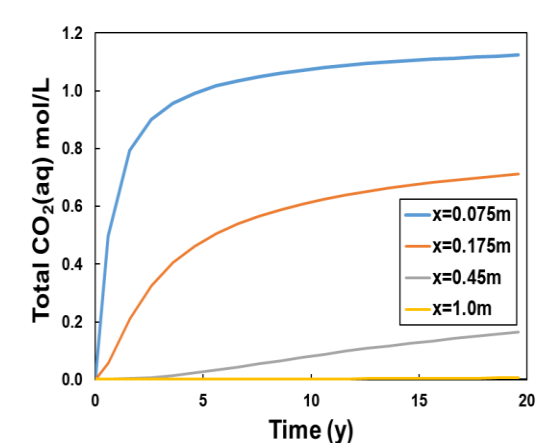
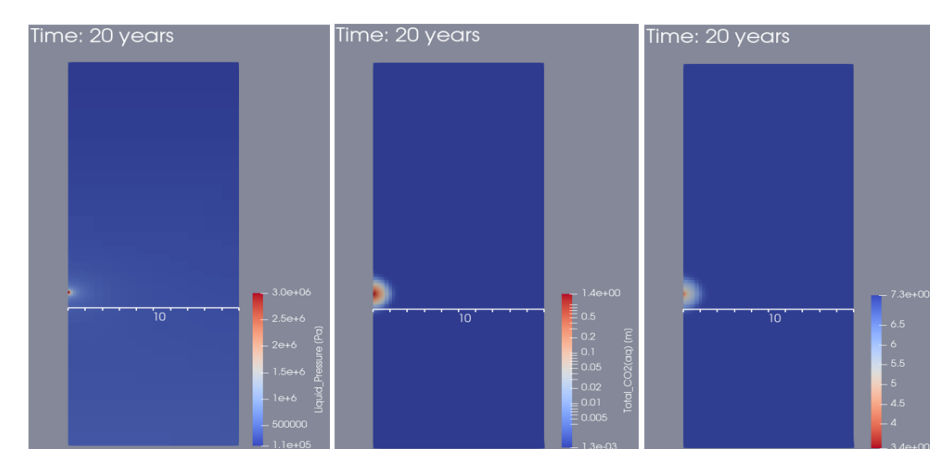
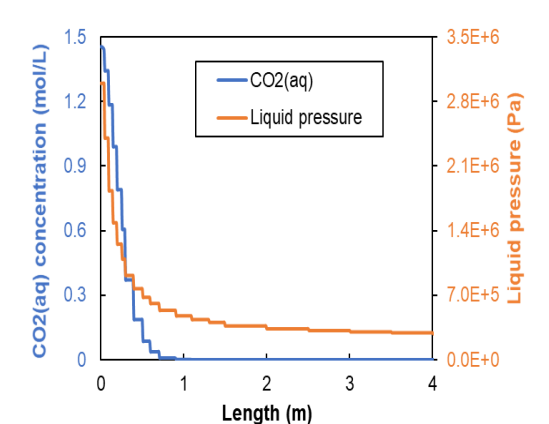
preliminary numerical 2D HM models

- simulations of coupled hydraulic and mechanical processes, see Sciandra et al., Hydromechanical modeling of CL experiment, Mont Terri Technical Meeting vTM-39, 26. January 2022, virtual, Switzerland



preliminary numerical 2D HC models

- simulations of coupled hydraulic and chemical processes for 20 a using different injection modes, permeabilities, diffusivities, and reservoir pressures



experimental laboratory investigations

- multiphysical characterisations in analytical laboratory of sandy and shaly facies of Opalinus clay

